Dynamic Structure Function of a Model Supersolid

CHI-DEUK YOO, ALAN DORSEY, Department of Physics, University of Florida — Second sound, which is a fingerprint of superfluid behavior, can be observed in light scattering through the splitting of the central Rayleigh peak of the thermal diffusion mode into an additional Brillouin doublet of the second sound [1,2]. Since a supersolid undergoes a similar transition as a superfluid, we expect that the Rayleigh peak due to the defect diffusion mode in a normal solid will split into a Brillouin doublet of propagating modes in the supersolid phase. In this work, we have derived the hydrodynamic equations of motion including defects, and obtained both the second sound mode and the dynamic structure function for an isotropic and isothermal supersolid. We find the splitting occurs not only in the transition from a normal fluid to a superfluid but also from a normal solid to a supersolid, which might be observable in light scattering.